founders, and whose President he afterwards became. In addition to these and other papers of a geological and mineralogical nature, he undertook, in 1858, the revision and practically the editorship of Greg and Lettsom's "Mineralogy of Great Britain and Ireland," to which he made many original contributions. He also wrote the article "Mineralogy" for the last edition of the "Encyclopædia Britannica." In 1878 he received the Keith medal of the Royal Society of Edinburgh. Until a few weeks before his death he was engaged on an exhaustive work upon the mineralogy of Scotland, bringing together the results of all his investigations and analyses. This he left almost complete, and it is to be hoped that it may shortly be published.

In the long course of his mineralogical activity Dr. Heddle gathered very large and valuable collections of minerals, both general and Scottish. The latter of these, the fruit of many journeyings, was three years ago acquired by the Museum of Science and Art, Edinburgh, and is now on exhibition there, arranged and labelled by Dr. Heddle himself.

Although a specialist in mineralogy, Dr. Heddle's sympathies were not by any means confined to this subject, and embraced not only cognate sciences, such as chemistry on the one side and geology on the other, but extended to many other branches of science. As a chemist he was most painstaking and exact, and has published several hundreds of analyses of Scottish minerals, collected and carefully picked by himself. He was always most particular to indicate the possible impurities as a geologist. He published detailed maps of Shetland and Sutherland, and contributed to the unravelling of the problem of the North-west Highlands. He was a very observant student of the influence of geological structure upon the scenery of a country. In some respects he was in advance of his time as a geologist, and has lived to see suggestions, which were ignored when made by him, worked out by others and generally accepted. Many of his papers, which were founded on a wide research, are extremely suggestive and instructive. Perhaps among the best known are those where he expounds his law of pseudomorphous replacement, and where he enunciates the connection between the colloidal and crystalline states of a substance and its specific heat.

Dr. Heddle had an acute and exact eye, a clear intellect, and a wonderful memory. He was a good draughtsman, and his crystal drawings were most admirable. He grudged no trouble in smoothing the path of the tyro in his favourite science, and was most generous in his recognition of any work done by others. His kindly and genial disposition endeared him to a wide circle of friends.

J. C.

NOTES.

M. MOUREAUX has just completed the installation of the new magnetic department of the Parc St. Maur Observatory; and it will be set in operation on December 1. The work at the old magnetic rooms will be continued until January 1, in order to supply M. Moureaux with a sufficient number of observations for a reduction of the valuable records obtained continuously during a number of years.

PROF. JAMES B. HATCHER, curator of the department of vertebrate palæontology of Princeton University, sailed from New York a few days ago for Rio Janeiro, *en route* for Southern Patagonia. He expects to land finally at Punta Arenas, and thence work northward along the eastern base of the Andes as far as the Argentine territory of Chubut, studying the palæontology and geology of the country. The expedition will be gone three years, and aims to bring home a complete collection of birds and mammals from the Tertiary deposits of Patagonia.

IN the course of next month, the American Philosophical Society will award the Magellanic gold medal to the author of what is adjudged to be the best discovery, or most useful invention, relating to navigation, astronomy, or natural philosophy (mere natural history—the words are the Society's own—only excepted). The prize was founded in 1786 by John H. de Magellan, of London, and consists of a medal "of solid standard gold of the value of ten guineas."

SIR WILLIAM CROOKES will be the guest of the evening at the Club House Dinner of the Camera Club on December 7.

AT the meeting of the Entomological Society of London last week, the Chairman referred with regret to the death, while serving on the Indian Frontier Expedition, of Captain E. Y. Watson, Fellow of the Society, and well known for his writings on Oriental Rhopalocera.

THE Paris Academy of Medicine has been authorised to accept the legacy of forty thousand francs bequeathed to it by Dr. Eugène Dupierris. The legacy is to be used to found a biennial prize for the best work on anæsthesia, or on diseases of the urinary canals.

A NEW medical society has been formed in St. Petersburg; it will be known as the St. Petersburg Ophthalmological Society, and its first president is Prof. Dobrovolski.

THE *Athenæum* states that the first meeting of the present session of the German Chemical Society at Berlin was devoted to a *Gedächtnisfeier* in honour of the late Prof. Victor Meyer.

JUBILEE medals have been conferred upon Dr. Günther, President of the Linnean Society, Prof. Dewar, president of the Chemical Society; and Prof. R. Meldola, late president of the Entomological Society.

PROF. A. BAUER has been obliged, on account of ill-health, to decline the office of president of the third International Congress for Applied Chemistry, which is to be held next year at Vienna, and Dr. H. R. von Perger has been elected in his stead. There will be twelve sections in connection with the Congress. Among the subjects to be discussed is the introduction of uniform methods of analysis of chemical products.

THE Paris correspondent of the *Lancet* notes the return of M. Raoul from Malaita, where he has for some time been engaged for the Government in making researches as to the existence of indigenous plants that might be turned to account scientifically or commercially. Several members of M. Raoul's party were bitten by snakes of different kinds, and were injected with Dr. Calmette's serum with very great success.

DR. A. LUSTIG, writing in the *Atti dei Lincei*, describes some important observations made in India on vaccination as a preventive of bubonic plague, and also on sero-therapic methods of treatment. At the time when the plague was raging in Bombay last June, Dr. Lustig made a number of experiments both on human subjects and on monkeys. Thirty persons suffering from the disease were inoculated with serum, and of these only four died during the treatment. In conjunction with Dr. G. Galeotti, the same writer made experiments on rats with a view of ascertaining whether there existed any hereditary transmission of the immunity conferred by vaccination. It was found that in no case did vaccination of either or both parent animals at any stage prevent the progeny from taking the disease.

IN the Budget of the French Minister of the Interior, the grant of 106,000 francs for the therapeutic serum service of the

Pasteur Institute is set down for payment. In 1895, 45,203 doses of anti-diphtheric serum, each ten centigrams in amount, were distributed gratuituously, and in 1896 the number was 28,217. Since the commencement of the work, as many as 137,058 doses of antitoxic serum have been distributed by the Institute, 5500 of them being for veterinary purposes.

WE regret to announce the death of Dr. F. Stohmann, honorary professor of agricultural chemistry in the University of Leipzig; and also of Dr. J. Frenzel, curator of the "Müggelsee" biological station near Berlin, and formerly professor of zoology in the Cordoba University, Argentine Republic.

THE death of Dr. Leonhard Sohncke, at the age of fifty-five, is announced. Dr. Sohncke at the time of his death was professor of experimental physics and director of the Physical Laboratory at the Munich Technical High School.

THE Natural History Society of Hanover will celebrate its centenary on December 10-12.

IN a previous number of NATURE (vol. lvii. p. 32) we referred to the death of Prof. Ernst Schering, of Göttingen. Some interesting details of his life and work have now been published by Prof. Wilhelm Schur (*Astronomische Nachrichten*, No. 3458), to which brief reference may be made. Born in the year 1833 at Sandbergen, near Lüneburg, Schering studied in Göttingen under Gauss from the year 1852, was made "ausserordentlicher" professor in 1860, and "ordentlicher" in 1868. In 1869 the magnetic part of the observatory department was made distinct from the astronomical, and the former put under the direction of Schering with the object of continuing the magnetic observations made in the first instance by Gauss. After Klinkerfues' death Schering took over the direction of both departments. During the years 1858 to 1863 Schering took part with Klinkerfues in the zone-observations, which were published in 1891. In 1874 he published a generalisation of Poisson-Jacobi's perturbation formulæ, in 1877 a "Festrede" at the celebration of the hundredth anniversary of Gauss's birthday, and in 1884 a solution of Kepler's equation (*Astronomische Nachrichten*, 2605). His chief work was, however, the publication of Gauss's works in seven volumes. Schering leaves behind him, besides a widow, one daughter and two sons.

Science states that the American Society of Naturalists and the affiliated societies will meet at Ithaca, N.Y., on December 28, 29 and 30. At the opening meeting an address of welcome will be delivered by President Schurman. On the second day of the meeting the principal item on the programme is a discussion on "The Biological Problems of To-day," in which the following speakers will take part: Prof. H. F. Osborn (on Palæontology), Prof. W. Trelease (on Botany), Prof. B. G. Wilder (on Anatomy), Prof. McKeen Cattell (on Psychology), Prof. J. Loeb (on Physiology), Prof. T. H. Morgan (on Developmental Mechanics), Prof. C. B. Davenport (on Morphogenesis).

PROF. TH. W. ENGELMANN, of Utrecht, has just published (Wilhelm Engelmann, Leipzig) a small case ($6\frac{1}{2} \times 9\frac{1}{2}$ inches) containing two sets of tables on which it is intended the results of spectroscopic and spectrophotometric observations may be plotted. The first table, of which there are nine duplicates, consists of six coloured continuous spectra arranged under one another, which serve as a background, so to speak, on which absorption spectra may be drawn. A series of vertical lines forms the scale of wave-lengths, and the positions of the chief Fraunhofer lines are marked in the upper strip. The second table, of which there are also nine similar ones, is somewhat differently arranged. At the upper part is a coloured continuous spectrum as before, with the positions of the chief Fraunhofer lines marked, and below is a series of horizontal and vertical lines, the former to represent the wave-lengths, and the latter the intensities per cent. This will be found useful for recording the positions and extensions of absorption-bands, and determining the light-curve of the spectra under investigation. Both these sets of tables are impressed on good thick sheets of paper, and the coloured spectra and graduations are very neatly reproduced. It is a pity that the red end of the spectrum is placed on the left, and not on the right hand, as this may tend considerably to diminish the usefulness of these cards. Accompanying these sheets are also two numerical tables expressing (1) the coefficients of extinction for different intensities, and (2) the relative intensities after the passage through coloured media of different thicknesses.

THE *Proceedings* of the Liverpool Geological Society for the last session contains a paper by the president, Mr. J. Lomas, on the Hereford earthquake of last December. The map which accompanies it shows the isoseismal lines, so far as they can be drawn, corresponding to the intensities 4, 5, 6 and 7 of the Rossi-Forel scale. These curves are somewhat elliptical in shape, and are grouped symmetrically about a line running N.N.W. from a point a little east of Hereford. Mr. Lomas attributes the earthquake to the friction generated by the slipping of strata somewhere along the Severn Valley, and he considers it probable that the slip extended for some distance along the axis of the isoseismals.

THE effect of temperatures upon the hibernation of injurious insects forms the subject of a short paper by Dr. L. O. Howard in the *Proceedings* of the ninth annual meeting of the Association of Economic Entomologists, just issued by the U.S. Department of Agriculture. It is a well-known fact among agriculturists and horticulturists that winter weather of a steady degree of severity is more favourable to plant growth than a winter with alternating frosts and thaws. With regard to certain injurious insects, it has become an accepted idea among economic entomologists that this same principle holds good, but farmers and others believe a winter which has been unusually severe will result in the destruction of injurious insects to such an extent as to promise comparative immunity in the next season. Experiments were required to throw light upon the matter, and these have been carried out by Dr. Albert M. Read, of Washington, the manager of the cold storage department of the American Security and Trust Company. Dr. Read has found, in the course of his experiments, that a consistent temperature in the neighbourhood of 18° F. will not destroy the larvæ of *Tineola biscelliella* or of *Attagenus piceus*, but that an alternation of a low temperature with a comparatively high one invariably results in the death of the larvæ of these two insects. For example, if larvæ of either which have been kept at a temperature of 18° F. are removed to a temperature of from 40° to 50° F. they will become slightly active, and when returned to the lower temperature and kept there for a little time, will not revive upon a retransfer to the warmer temperature. Dr. Howard remarks that it is satisfactory to have experimental proof in support of previously accepted, but more or less theoretical, ideas.

AT the Imperial Institute on Monday night, Mr. E. S. Bruce gave a lecture on his system of electric balloon signalling as applied to scientific exploration in Arctic and Antarctic regions. Major P. A. MacMahon was in the chair. After pointing out how great an advantage it would be for a party to have a means of communicating with the ship when away on an exploring expedition, the lecturer described his system, in which a group of electric lamps was mounted inside a balloon connected with the earth by an electric cable. The operator and most of the apparatus would be on the ground or the deck of a ship, and therefore the balloon could be made easily portable. Goldbeaters' skin would be the best material to employ for the covering, and the smallest size of balloon he could recommend for Arctic exploration purposes would be about 7 feet in diameter, with a capacity of 150 cubic feet and able to lift 500 feet of cable. The necessary gas could be stored in steel tubes, or a portable gas-making machine might be carried. The source of electric power would be a dynamo, with which Mr. Bruce supposed every future Arctic expedition would be provided, and this could be operated by wind power, if coal ran short, or even by hand. By giving long and short flashes on the lamps, it would be possible to convey messages in the Morse alphabet.

SOME time ago, G. Jung gave a solution of the problem "to determine by the method of least squares the plane which most nearly coincides with n non-coplanar points." In the *Rendiconti del R. Istituto Lombardo*, ii. xxx. 16, a brief abstract is given of an investigation by the same writer of the reciprocal problem: "Given n non-concurrent planes, to find the point most nearly determined by them." The corresponding problem in plane geometry has been attacked by M. d'Ocagne, and Prof. Jung has thus extended the method to three-dimension space, besides giving a generalisation of certain constructions first investigated by M. Berthot.

IN the *Journal of the Royal Statistical Society* (September), Mr. W. F. Sheppard considers the calculation of the average square, cube, &c., of a large number of magnitudes. Supposing that a number of measurements are tabulated to the nearest multiple of a particular unit (*e.g.* the chest measurements of 5732 Scotch soldiers to the nearest *inch*), the data do not enable us to find *exactly* the true average measurement or the average square or cube of the magnitudes. Mr. Sheppard shows that the *rough value*, obtained by supposing each measurement to be equal to the nearest multiple of the unit, differs in some cases considerably from the *most probable* value of the average in question, and he finds that for laws of distribution which satisfy certain conditions a very close approximation to the latter may be obtained by applying certain simple corrections to the "rough values" first calculated.

IN the *Mathematical Gazette* for October we are glad to see that Mr. R. F. Muirhead calls attention to the old treatment of the "Parallelograms of Velocities and Accelerations," which still survives in many otherwise excellent text-books on dynamics. The enunciation often introduces the notion of "a moving point or body possessing simultaneously two velocities," a notion which is meaningless until coexistent velocities (which would better be spoken of as "velocity components") have been defined. The usual (so-called) "proof" tacitly involves the idea of a body *moving relatively* to a certain base which is itself in motion, but as the word "relative" is generally omitted, and the parallelogram of velocities is usually given before relative motion is considered, and, moreover, is employed in the discussion of relative motion, the learner's mind is often puzzled and he fails to grasp the theorem. Mr. Muirhead rightly contends that the only logical way out of the difficulty is to make relative motion precede the discussion of the parallelogram law, unless, indeed, the latter be regarded merely as a *definition* of component velocities and acceleration.

WE have received from Mr. R. C. Mossman a copy of a very valuable and laborious investigation of the Meteorology of Edinburgh, based upon observations during the past 132 years, from documents mainly collected by the Scottish Meteorological Society. The work is published in the *Transactions* of the Royal Society of Edinburgh, and is divided into two parts, the first dealing with the climatic elements for each day of the year, and the second with monthly and annual means, and with secular and other weather changes. The smoothed curves show that the warmest day of the year falls on July 15, and the coldest on January 8. The mean daily maximum temperature is above the annual average (46°·8) from April 26 to October 14, but the mean minimum does not get above the yearly mean until May 12, and it remains above it till October 19. The greatest excess of sun over shade temperature was 76°·8 in March 1892, and the grass minimum thermometer fell 12°·6 below the minimum in shade in May 1890. The mean annual rainfall is 25·86 inches; the wettest period is that embraced in the seven days ending August 18; while the period distinguished by the least rain-fall, is the week ending with March 27. One very interesting feature of the discussion is a chronological appendix of remarkable atmospheric phenomena at Edinburgh, extending from 1575 to 1895, which has been compiled from a variety of sources.

A NOTE in *Science* states that Dr. O. Holst, of the Geological Survey of Sweden, after two years' leave of absence granted him for the purpose of studying the new gold-fields in Western Australia, has now returned. Dr. Holst saw the ancient Australian glacial deposit which is supposed to belong to the Permian age, and says there can be no doubt but that it is an indurated boulder-clay. Its age may possibly be somewhat later than heretofore supposed, but not so much later as to detract from the importance of its bearing on the subject of geological climate. In the semi-desert, where Dr. Holst spent most of his time, the wind did not appear to him to be of any great importance as a geological agent, although dust storms are sometimes reported from the new towns on the border of the desert. One of the Australian geologists has lately made some interesting observations on what resembles a tidal action of the ground water in the sandy region in the interior. The water rises and falls at regular daily intervals, and the oscillations appear to be too great to be explained as resulting from the daily variations in atmospheric pressure.

THE *Electrician* calls attention to a new development in the design of electrically-propelled pleasure craft, which has been given the name of the "Nymph." Briefly, the "Nymph" is an attachment to an ordinary pleasure boat, sailing ahead of it but rigidly connected to it, the boat containing the accumulator cells and the switch-gear by which is controlled the motor in the body of the swan-shaped tug. The craft is guided or steered by two reins attached to the head of the "swan," and these reins actuate by gear the ordinary rudder. A regulator situated close to the right-hand of the driver enables him to control the speed of the motor and propeller in the "swan," and to go at full or half-speed, ahead or astern. There are sixteen chloride cells of seventeen plates each, and these, for starting and low speeds, are connected to the motor in two parallels of eight cells each, all the cells being used in series for full speed. The total electrical capacity of the battery is about 300 ampere hours, and this is equal to propelling the boat at a speed of eight miles an hour for six hours, or a total distance of about fifty miles, with six people on board. No resistances are used, and neither the field nor the armature is divided up in any way to regulate the speed. The vibration of the boat is perceptibly less than in one containing the motor. Although the arrangement lends itself to graceful design, there is probably considerable loss of efficiency as compared with the usual stern propeller.

THE Commission appointed by the German Government to study the plague in Bombay, and which commenced its work under the presidency of Prof. Dr. Gaffky last March, has published the results of its labours in several numbers of the *Deutsche medicinische Wochenschrift*. The report is a very elaborate and exhaustive one, and contains a mass of valuable experimental material. It would appear that in the majority of cases the plague-bacillus obtains access to its victims through small wounds or scratches on the body, reminding one of the same method adopted by the anthrax bacillus for infection. As Yersin has already pointed out, plague is essentially a disease which afflicts the poor and miserably-housed lower classes of the population, their habits and repugnance to all sanitary precautions, and prejudice against the hospitals, rendering its suppression a matter of extreme difficulty. In the hospitals, thanks to systematic disinfection and scrupulous cleanliness, cases of plague amongst the staff were very rare. The Commission have discovered that the serum of human beings, as well as that of animals which have recovered from plague, exerts a specific action on plague bacilli outside the body, producing the phenomenon of the clumping together of the bacilli now so familiar in the case of typhoid bacilli under similar circumstances. Numerous researches were carried out to test the vitality and powers of endurance possessed by these bacilli under very varied conditions. For example, in sterilised tap-water they were found to be dead after three days, whilst in ordinary tap-water a single day's immersion was sufficient to destroy them. Very sensitive also are these microbes to the action of disinfectants, corrosive sublimate diluted to 1 in 1000 parts at once destroys them, whilst a 1 per cent. solution of carbolic acid also kills them within ten minutes. Heating for ten minutes at 55° C. destroys them, as also does exposure to a temperature of 80° C. for five minutes, whilst in a liquid just brought to the boiling point, and at once examined, they were also entirely annihilated. Perhaps the most interesting part of the report is that which deals with the inquiries made into the respective merits of Yersin's and Haffkine's anti-plague inoculations. Yersin's serum inoculations in Bombay do not appear to have been as successful as those which he previously carried out in cases of plague at Amoy. Dr. Roux was, however, preparing a yet stronger serum at the Paris Pasteur Institute, and it was hoped that it might prove more efficacions. On the other hand, Haffkine's inoculations appear to have been very successful, although the protection against plague afforded by them is by no means absolute. Haffkine's method consists in adding a weak solution of carbolic acid or essence of mustard to a virulent growth of plague bacilli, thereby destroying the microbes; their products, however, which remain, possess a remarkable protective power. The vaccine may also be procured by heating the plague-cultures to 65° C. for one hour, or during two hours to 51° C. This method of heating appears to yield the best vaccine. It is impossible here to enter into further details of this valuable report, which forms a most important contribution to the scientific literature already existing on plague and its dissemination.

Mr. Charles Louis Hett, of Springfield, Brigg, has prepared a list of the calls of some two hundred British birds, and appeals for the assistance of other students of bird-life, either in checking calls already recorded, or in supplying those of other birds. He promises to finish the compilation and to issue it from the press, provided he receives the co-operation needed.

Herren Mayer and Müller, of Berlin, ask for subscriptions for an important work on Orchids, of which the first volume is already in type—"Orchidacearum Genera et Species," by Prof. F. Kraenzlin, to be completed in six volumes. No complete separate systematic work on the Orchidaceæ has been published since Lindley's Synopsis, which was issued sixty years ago.

Cohn's "Kryptogamen-Flora von Schlesien" is a work of much more than local interest, the various families of Cryptogams having been worked out with the greatest care by experts in the various departments. The last part received (3$^{\text{er}}$ Band, 2$^{\text{te}}$ Hälfte, 4$^{\text{te}}$ Lieferung) completes the Pyrenomycetes, and contains an introduction to the so-called "Fungi imperfecti," those in which the conidial, but not the ascogenous form is known. This portion of the work will, unfortunately, remain uncompleted, as it stood in the hands of Dr. J. Schröter at the time of his death in 1894, Prof. Cohn not having been able to find any one to complete the work left unfinished by that eminent mycologist. An interesting feature of Dr. Schröter's work in this section of Fungi is that he has discarded the term genus, arranging the species under *Formgattungen* or "form-genera."

Messrs. Ross, Ltd., have just issued a very full illustrated catalogue of the instruments made by them.

Messrs. Abbott, Jones, and Co. announce for early publication "The Life of James Abernethy, past-president of the Institute of Civil Engineers." The book will be the work of John S. Abernethy, and will be illustrated.

The sixteenth Annual Report of the Bureau of American Ethnology has reached us, and contains the following papers:—"Primitive Trephining in Peru," "Cliff-Ruins of Canyon de Chelly, Arizona," "Day Symbols of the Maya Year," and "Tusayan Snake Ceremonies."

The catalogues issued from time to time by Mr. Bernard Quaritch are always interesting, but few, if any, of those recently issued can compare with the one dated November 12. which has just reached us. It is entitled "Monuments of Printing," and contains particulars of books produced by the earliest presses in Germany, the Netherlands, Italy, France, Spain and England from 1455 to 1500, and a few remarkable examples of a somewhat later date. The catalogue is one which will be prized by all students of typography.

The *Photogram* for November contains several short articles of interest to photographers. Mr. C. F. Townsend writes about sensitometers, giving a brief historical summary of the methods employed. Under the heading of "Applied Photography in Ship Salvage Work" is the title of an article by Mr. Charles H. Evans, who points out the many difficulties that are met with in this class of work. The illustrations accompanying the text are very much to the point, being good examples of the work undertaken. Other branches of the art dealt with are photomicrography, exact measurements with the X-rays, toning bromide prints, &c., together with useful information in the form of notes on many other points of interest.

Volume v. of the *Transactions* of the Institution of Mining and Metallurgy for the sixth session has reached us, and is a bulky work, containing reports of some eighteen papers, and the discussions which took place upon them. The Institution during the session referred to had upon its books the names of 449 members, associates and students, as against 372 for the session of 1895–96.

Messrs. Macmillan will publish shortly a work entitled "A Text-Book of Zoology," under the joint authorship of Profs. T. Jeffery Parker and W. A. Haswell. Special attention is called to the illustrations, of which there are over a thousand in the two volumes that comprise the work. For the most part these illustrations are original, and have been drawn by Mr. N. J. Parker.

Of all the periodicals which come before us week by week, and month by month, not one fulfils its particular purpose better than the *Engineering Magazine*. The magazine is always attractively illustrated; the articles in it deal with subjects which are of prime importance in the engineering world; and the monthly digest of the entire technical press is a very valuable index to current technical literature. The issue of a distinctly European edition of the magazine was commenced last month, and we are confident that it will meet with as much success here as it has in the United States.

THE additions to the Zoological Society's Gardens during the past week include a Macaque Monkey (*Macacus cynomolgus*) from India, presented by Mr. F. Greswolde-Williams; a Suakin Gazelle (*Gazella brookii*) from Abyssinia, presented by Dr. L. de Gebert; two Ring-necked Parrakeets (*Palæornis torquatus*) from India, presented by Mrs. G. F. Cooper; a Macaque Monkey (*Macacus cynomolgus, albino*) from Manilla, presented by Mr. James Coombs; two Double-spurred Francolins (*Francolinus bicalcaratus*) from West Africa, four Rosy Bullfinches (*Erythrospiza githaginea*), bred in England, presented by Mr. E. G. B. Meade-Waldo; two Herring Gulls (*Larus argentatus*), British, presented by Mr. T. Hope Robinson; two Rhomb-marked Snakes (*Trimerorhinus rhombeatus*), two —— Snakes (*Chlorophis hoplogaster*), a Puff Adder (*Bitis arietans*) from South Africa, presented by Mr. J. E. Matcham; a Ring-tailed Lemur (*Lemur catta*, ♀) from Madagascar, a Macaque Monkey (*Macacus cynomolgus*) from India, deposited; six Rosy-faced Love Birds (*Agapornis roseicollis*) from South Africa, a Malaccan Parrakeet (*Palæornis longicauda*) from Malacca, four Siskins (*Chrysomitris spinus*), four Lesser Redpolls (*Linota rufescens*), British, a Bridled Wallaby (*Onychogale frenata*) from Australia, a Loggerhead Turtle (*Thalassochelys caretta*) from the Mediterranean, purchased.

OUR ASTRONOMICAL COLUMN.

THE NOVEMBER METEOR SWARMS.—Up to the present time we have not received any news that the Leonids were more abundant this year than last. Indeed, bad weather seems to have universally prevailed about the time of observation. At the Paris Observatory five observers only noted twenty meteors, while M. Hansky, at the Meudon Observatory, saw in all seven, four of which were Leonids. M. Janssen, in consequence of the exceedingly bad weather experienced in Western Europe, telegraphed to San Francisco to inquire whether a more brilliant display had been noted there. The answer he received was to the effect that nothing more than the ordinary shower was observed. Perhaps, however, observers may be (or may have been) more fortunate with the Andromedes, which are expected between the 23rd and 27th of this month. This swarm is also of considerable strength, and should be more than usually active Its period of revolution being six and a half years, and the last maximum having occurred on November 23, 1892, we expect the shower this month to be above the ordinary yearly display. There are several points about the Andromedes that are of peculiar interest. One of these is that the orbit in which they move is very similar to that of the comet Biela; in fact, the bodies which produce the phenomena of shooting stars may be none other than the component parts of this comet. In the years 1872 and 1885 the maximum display occurred on the 27th of the month, but at the following expected shower it took place on the 23rd. This difference is explained, according to Bredichin, by the perturbatory effects due to the proximity of the planet Jupiter, thus causing the node to recede 4°. The radiant point of this swarm (25° + 43°) has a large northern declination, which renders it always above the horizon. The meteors themselves are different from the Leonids in that they move more slowly, and are of a yellowish tinge.

In the note under this heading, that appeared last week, it should have been mentioned that the observations recorded were made by Dr. W. J. S. Lockyer at the Solar Physics Observatory, South Kensington.

In another part of this journal Mr. Denning summarises the results of this year's Leonid display.

CURRENT ASTRONOMICAL ARTICLES.—M. Gaston Armelin contributes an interesting article on that curious variable Mira Ceti to *La Nature* for November (No. 1274). After a brief historical summary the writer describes some theories current to-day, and points out the variations in the time of maxima observed of late years, and their consequent suggested explanations.—The bulletin of the *Société Astronomique de France* for the same month contains, among other interesting matter, a drawing of comet Perrine as observed at the observatory of Juvisy. M. Camille Flammarion deals with the Leonid swarm of meteors. The number contains several contributions of planetary notes.—In the October number of *Himmel und Erde*, a brief account is given of the present state of the proposed large Potsdam refractor. There seems to have been some difficulty about the optical parts, so that it has been decided to assume that the aperture will be 80 cm., and commence at once with the construction of the instrument and a suitable dome. This instrument when finished will be then the largest in Europe, the aperture being nearly thirty-two inches. This article contains the results of many investigations on the absorption properties of different thicknesses and kinds of glass.

COMET PERRINE (OCTOBER 16).—This comet is gradually becoming fainter, but a continuation of the ephemeris for the current week will perhaps prove useful:—

12*h*. *Berlin M.T.*

1897.	R.A.	Decl.	log *r*.	log Δ.	Br.
	h. m. s.	° ′			
Nov. 25	18 16 49	+59 24·6			
26	15 45	58 44·8	0·1376	0·0278	0·7
27	14 47	58 6·4			
28	13 54	57 29·3	0·1366	0·0370	0·7
29	13 6	56 53·4			
30	12 23	56 18·8	0·1357	0·0459	0·7
Dec. 1	11 43	55 45·5			
2	11 7	55 13·5	0·1351	0·0546	0·7
3	18 10 34	+54 42·4			

REV. DR. SEARLE has resigned the directorship of the astronomical observatory of the Catholic University of America. His place will be taken by Mr. Alfred Doolittle.

THEORY OF THE MOTION OF THE MOON.[1]

OF the lunar theories hitherto completed the two greatest are undoubtedly those of Hansen and Delaunay. The former has for its chief object the formation of tables: the inconvenience of slowly converging series is avoided by using numerical values throughout; and the problem solved is the one actually presented by nature, every known cause of disturbance being allowed for. It suffers, however, under the disadvantage that there are no means of correcting the results for any change in the values of the constants that observation may demand. This drawback was avoided by Delaunay, but only at the expense of still greater evils from the point of view of the making of an ephemeris; for owing to the slow convergence of certain series, twenty years' labour did not suffice to give sufficiently approximate results; moreover, the problem had to be considerably modified from the circumstances of nature, in order to achieve a result within even so long a time.

The memoir that Dr. Brown has lately presented to the Royal Astronomical Society, forms the first part of a fresh attempt to calculate the motion of our satellite. All Delaunay's modifications of the problem are adopted: that is to say, the sun and earth are supposed centrobaric, the mass of the moon is neglected, as is also the action of the planets, and the true mass of the sun is increased by that of the earth. The calculation of the effect of the attraction of the planets and of the protuberant parts of the earth's equator will follow when the modified problem is solved. The solution can also be easily modified so as to allow for the greater part of the effect of the remaining modifications, and the outstanding error Dr. Brown has shown to be insensible to observation; but it is, however, far larger than the minute fraction of a second to which his calculations are pushed.

Dr. Brown's theory resembles Delaunay's in being algebraical with, however, one important exception: the ratio of the mean motions is replaced by its numerical value. By this means the slowly converging series that occur in Delaunay's theory are avoided; and no admissible correction of the value of the above ratio can introduce any change in the results that would be sensible to observation. This modification in the form, combined

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[1] "Theory of the Motion of the Moon." Containing a new calculation of the expressions for the coordinates of the Moon in terms of the time." By Ernest W. Brown, M.A., Sc.D. (Reprinted from the *Memoirs* of the Royal Astronomical Society, vol. liii.)